CHAPTER 2. ANALYTICAL FRAMEWORK

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CHAPTER 2. ANALYTICAL FRAMEWORK

2.1 INTRODUCTION

Sections 6295(o)(2)(A) and 6316(a) of 42 U.S.C. require the U.S. Department of Energy (DOE) to set forth energy conservation standards that are technologically feasible and economically justified and would result in significant additional energy conservation. This chapter provides a description of the general analytical framework that DOE uses in developing such standards, in particular, standards for residential dishwashers, dehumidifiers, and cooking products, and commercial clothes washers ("the considered products"). The analytical framework is a description of the methodology, the analytical tools, and relationships among the various analyses that are part of this rulemaking. For example, the methodology that addresses the statutory requirement for economic justification includes analyses of life-cycle cost (LCC); economic impact on manufacturers and users; national benefits; impacts, if any, on utility companies; and impacts, if any, from lessening competition among manufacturers. DOE has also solicited the views of the U.S. Department of Justice (DOJ) on any lessening of competition likely to result from the imposition of a proposed standard.

Figure 2.1.1 summarizes the analytical components of the standards-setting process. The focus of this figure is the center column, identified as "Analyses." The columns labeled "Key Inputs" and "Key Outputs" show how the analyses fit into the rulemaking process, and how the analyses relate to each other. Key inputs are the types of data and information that the analyses require. Some key inputs exist in public databases; DOE collects other inputs from stakeholders or persons with special knowledge. Key outputs are analytical results that feed directly into the standards-setting process. Dotted lines connecting analyses show types of information that feed from one analysis to another.

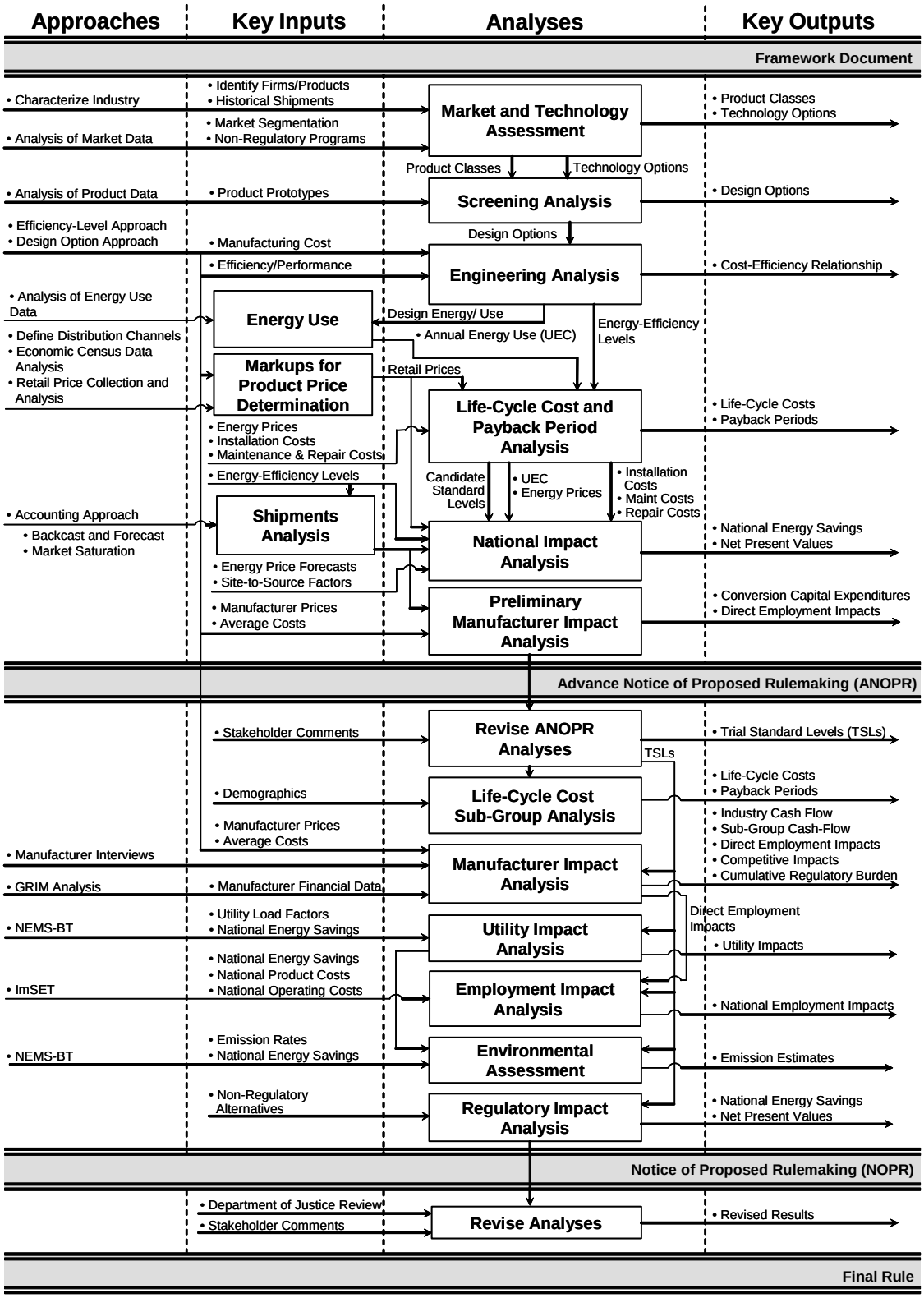

Figure 2.1.1 Flow Diagram of Analyses for the Rulemaking Process

The analyses performed in the advance notice of proposed rulemaking (ANOPR)[a] stage and reported in the ANOPR technical support document (TSD) include:

- A market and technology assessment to characterize the relevant product markets and existing technology options, including prototype designs.

- A screening analysis to review each technology option and determine if it is technologically feasible; is practical to manufacture, install, and service; would adversely affect product utility or product availability; or would have adverse impacts on health and safety.

- An engineering analysis to develop cost-efficiency relationships, which are the increased manufacturer production cost (material, labor, and factory overhead) of more efficient products.

- A product price markup analysis to determine how manufacturing costs are converted to customer prices, which are then used in the LCC and payback period (PBP) analyses and the manufacturer impact analysis (MIA).

- An energy and water use analysis to determine the annual energy and water use of the considered products.

- An LCC and PBP analysis to calculate, at the customer level, the discounted savings in operating costs (less maintenance and repair costs) throughout the estimated average life of the covered products, compared to any increase in the installed cost likely to result directly from the imposition of the standard.

- A shipments analysis forecasts product shipments, which are then used to calculate the national impacts of standards on energy consumption and costs, net present value (NPV), and future manufacturer cash flows.

- A national impact analysis to assess the aggregate impacts at the national level of the NPV of total consumer LCC and national energy savings (NES).

- A preliminary MIA to identify key issues for the manufacturers and to qualitatively assess potential impacts of energy conservation standards.

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[a] In energy conservation standards rulemakings in the past, and for this rulemaking, DOE issued an ANOPR following publication of the framework document. EISA 2007 eliminated the requirement that DOE issue ANOPRs as part of the standards rulemaking process; see EISA 2007, at sec. 307. DOE is now using an alternative process known as the preliminary activities and analyses. The preliminary activities and analyses will provide the same information and ability for public comment as the ANOPR, but without publication of analyses in the *Federal Register*.

The analyses DOE performed in the subsequent notice of proposed rulemaking (NOPR) stage and reported in the NOPR TSD include those listed below. In addition, DOE re-analyzed the work done in the ANOPR stage. Because the Energy Independence and Security Act of 2007 (EISA 2007) (Pub. L. No. 110-140) amended the Energy Policy and Conservation Act (EPCA) of 1975 (42 U.S.C. 6291–6309) to establish revised energy conservation standards for residential dishwashers and dehumidifiers (42 U.S.C. 6295(g)(9) and (cc)), DOE is not adopting standards for these products in the final rule and instead is codifying these statutory standards in a separate final rule. Therefore, DOE did not re-analyze dishwashers and dehumidifiers for the NOPR, and is not reporting the results of the ANOPR analyses for these products in this TSD.

- An LCC subgroup analysis to evaluate variations in customer characteristics that might cause a standard to impact particular customer sub-populations differently than the overall population.

- An MIA to estimate the financial impact of standards on manufacturers and to calculate impacts on competition, employment, and manufacturing capacity.

- A utility impact analysis to estimate effects of proposed standards on electric and gas utilities.

- An employment impact analysis to assess the aggregate impacts of standards on national employment.

- An environmental assessment to provide estimates of the effects of standards on three pollutants—sulfur dioxide (SO_2), nitrogen oxides (NO_x), and mercury—as well as carbon emissions.

- A regulatory impact analysis to present major alternatives to proposed standards that could achieve energy savings at a lower cost.

After the publication of the NOPR, DOE reviewed comments from interested parties and revised its analyses as appropriate before issuing the final rule. In addition, information DOE received from interested parties regarding the NOPR indicated that further analyses were warranted for commercial clothes washers and microwave ovens as to standby power. As a result, DOE is continuing the rulemaking for these products. The information DOE developed for commercial clothes washers and microwave ovens as part of the market and technology assessment is presented in chapter 3, but the details of the analyses for commercial clothes washers and microwave oven standby power are not included in this TSD. Discussion of the analyses which were conducted at the NOPR stage for these products and equipment can be found in the NOPR TSD for this rulemaking, and updated analyses will be provided in a separate TSD when final rules are published for commercial clothes washers and microwave oven standby power. This final rule TSD contains details of the final analyses conducted for residential electric and gas kitchen ranges and ovens and microwave ovens as to cooking efficiency.

2.2 BACKGROUND

As described in chapter 1, the July 15, 1996, *Procedures for Consideration of New or Revised Energy Conservation Standards for Consumer Products* (the "Process Rule"), 61 FR 36974 (July 15, 1996) outlined procedural improvements to the standards rulemaking process which included a review of the following elements used in the rulemaking process: (1) economic models; (2) analytical tools; (3) methodologies; (4) non-regulatory approaches; and (5) prioritization of future rules. See appendix A to subpart C of Title 10 Code of Federal Regulations Part 430 (10 CFR Part 430).

DOE developed this analytical framework for the rulemaking on the considered products under the Process Rule. DOE documented this analytical framework in the *Rulemaking Framework for Commercial Clothes Washers and Residential Dishwashers, Dehumidifiers, and Cooking Products* (March 15, 2006), and presented the analytical approach to stakeholders during a public meeting held on April 30, 2006. The framework document is available at www.eere.energy.gov/buildings/appliance_standards/. The following sections provide a general description of the different analytical components of the rulemaking framework.

2.3 MARKET AND TECHNOLOGY ASSESSMENT

The market and technology assessment characterizes the relevant product markets and existing technology options, including prototype designs, for the considered products.

2.3.1 Market Assessment

When initiating a standards rulemaking, DOE develops information on the present and past industry structure and market characteristics for the products concerned. This activity assesses the industry and products, both quantitatively and qualitatively, based on publicly available information. As such, for the considered products, DOE addressed the following: (1) manufacturer market share and characteristics; (2) existing regulatory and non-regulatory product efficiency improvement initiatives; and (3) trends in product characteristics and retail markets. This information serves as resource material throughout the rulemaking.

DOE reviewed existing literature and interviewed manufacturers to get an overall picture of the markets for the considered products in the United States. Industry publications and trade journals, government agencies, and trade organizations provided the bulk of the information, including information on: (1) manufacturers and their market share; (2) shipments by capacity; and (3) market saturation. The appropriate sections of this TSD describe the resulting information as DOE used it in the analysis.

DOE has used the most reliable and accurate data available at the time of each analysis in this rulemaking. All data is available for public review.

2.3.2 Technology Assessment

DOE typically uses information relating to existing and past technology options and prototype designs as inputs to determine what technologies manufacturers use to attain higher performance levels. In consultation with stakeholders, DOE develops a list of technologies for consideration. Initially, these technologies encompass all those it believes are technologically feasible.

DOE developed its list of technologically feasible design options for the considered products through consultation with manufacturers of components and systems, and from trade publications and technical papers. Since many options for improving product efficiency are available in existing units, product literature and direct examination provided additional information.

2.4 SCREENING ANALYSIS

The screening analysis examines various technologies as to whether they: (1) are technologically feasible; (2) are practicable to manufacture, install, and service; (3) have an adverse impact on product utility or availability; and (4) have adverse impacts on health and safety. As described in section 2.3.2 above, DOE develops an initial list of efficiency-enhancement options from the technologies identified as technologically feasible in the technology assessment. Then DOE, in consultation with interested parties, reviews the list to determine if these options are practicable to manufacture, install, and service, would adversely affect product utility or availability, or would have adverse impacts on health and safety. In addition, DOE removed from the list technology options that lack energy consumption data as well as technology options whose energy consumption could not be adequately measured by existing DOE test procedures. In the engineering analysis, DOE further considers efficiency enhancement options that it did not screen out in the screening analysis.

2.5 ENGINEERING ANALYSIS

As presented in chapter 5, the engineering analysis establishes the relationship between the cost and efficiency of the considered products. This relationship serves as the basis for cost/benefit calculations in terms of individual consumers, manufacturers, and the Nation. Chapter 5 discusses the product classes DOE analyzed, the representative baseline units, the incremental efficiency levels, the methodology DOE used to develop manufacturing costs, and the cost-efficiency curves.

In determining the relationship between manufacturer cost and energy efficiency for the considered products, DOE estimated the increase in manufacturer cost associated with technological changes that increase the efficiency of the baseline models. DOE typically obtains cost estimates for the engineering analysis (which it also uses in the MIA) from detailed

incremental cost data supplied by manufacturers, disaggregated into the cost of incremental material, labor, and overhead. For reasons discussed in chapter 5, in this rulemaking, DOE created an industry-wide analysis for residential cooking products based primarily on the analysis developed for DOE's 1996 TSD for cooking products.

For each of the product classes presented in chapter 5, DOE selected efficiency levels and estimated incremental cost data at each of these levels based on updated values developed for the 1996 TSD. DOE conducted the engineering analysis on all product classes.

2.6 ENERGY AND WATER USE DETERMINATION

The energy use determination assessed the energy-savings potential of different efficiencies for residential cooking products. In the NOPR, DOE also evaluated the water-savings potential of more efficient commercial clothes washers. For reasons discussed in section 2.2, DOE is not presenting the analyses for commercial clothes washers in this final rule TSD.

As part of the energy use determination, DOE made certain engineering assumptions regarding product application, including how the product is operated and under what conditions. For cooking products, DOE considered the test procedures codified in the Code of Federal Regulations (CFR) to estimate annual energy consumption. 62 FR 51976.

2.7 MARKUPS FOR PRODUCT PRICE DETERMINATION

For the LCC and PBP analysis and the MIA, retail prices are required for the baseline efficiency level and all other efficiency levels under consideration. DOE derived retail prices by applying manufacturer-to-customer markups to the manufacturing cost estimates. To develop markups, DOE identified distribution channels (*i.e.*, how the products are distributed from the manufacturer to the customer.) Once DOE established proper distribution channels for each of the product classes, it relied on economic census data from the U.S. Census Bureau and input from the industry to define how products are marked up from the manufacturer to the customer.

2.8 LIFE-CYCLE COST AND PAYBACK PERIOD ANALYSIS

The effects of new energy conservation standards are changes in operating expenses—usually a decrease—and changes in customer price—usually an increase. DOE analyzed the net effect of new standards on customers by evaluating the net LCC using the cost-efficiency relationships derived in the engineering analysis, as well as the energy costs derived from the energy use determination. Inputs to the LCC calculation include the installed cost to the customer (customer price plus installation cost), operating expenses (energy expenses and maintenance costs), the lifetime of the appliance, and a discount rate.

The installed and operating costs of a product typically change in response to new standards—installed cost typically increases while operating cost typically decreases. Thus, there is a specific time in the life of a higher-than-baseline efficiency product when the net operating cost benefit (in dollars) from the time of purchase is equal to the incremental first cost of purchasing the higher efficiency unit. The length of time required for a product to reach this cost-equivalence point is known as the payback period.

For the ANOPR, DOE conducted the LCC and PBP analysis using typical values to reflect the conditions in the field for equipment life, equipment retail price, national or regional energy costs, energy consumption, and discount rates. DOE subsequently conducted the LCC subgroup analysis for the NOPR and included an assessment of impacts on subgroups of consumers. For the final rule, DOE updated the NOPR LCC and PBP analysis, as well as the LCC subgroup analysis, to reflect current energy costs.

To estimate the LCC for each of the considered products, DOE had to determine several input values, including retail prices; electricity and natural gas prices; discount rates; maintenance, service, and installation costs; and product lifetimes. DOE reviewed the Energy Information Administration (EIA)'s energy price data to establish electricity and natural gas prices for residential customers. DOE used EIA's *Annual Energy Outlook* (*AEO*) as the default source of projections of future energy prices in its LCC and PBP analysis.

DOE derived the discount rates from estimates of the interest or "finance cost" to purchase residential products. Following financial theory, the finance cost of raising funds to purchase these products can be interpreted as: (1) the financial cost of any debt incurred to purchase products, principally interest charges on debt, or (2) the opportunity cost of any equity used to purchase products, principally interest earnings on household equity.

DOE considered expected changes to maintenance, repair, and installation costs for the products covered in this rulemaking. Typically, small incremental changes in product efficiency incur no, or only very small, changes in repair and maintenance costs over baseline efficiency products. There is a greater probability that units with efficiencies that are significantly greater than the baseline will incur increased repair and maintenance costs, since such products are more likely to incorporate technologies that are new to the industry and not widely available. DOE used input from manufacturers, installers, and servicers in developing appropriate repair and maintenance costs.

DOE used information from various literature sources (*e.g.*, *Appliance Magazine*) and input from manufacturers and other interested parties to establish average product lifetimes for use in the LCC and subsequent analyses.

2.9 SHIPMENTS ANALYSIS

Shipment forecasts are required to calculate the national impacts of standards on energy, NPV, and future manufacturer cash flows. DOE developed shipment forecasts using historical data as a basis for projecting future shipments of the appliance products that are the subject of this rulemaking. In projecting shipments, DOE accounted for three market segments: (1) new construction; (2) existing buildings (*i.e.*, replacing failed products); and (3) early replacements. DOE used the early replacement market segment to calibrate the Shipments Model to historical shipments data. For purposes of estimating the impacts of prospective standards on product shipments (*i.e.*, forecasting standards-case shipments,) DOE accounted for the combined effects of changes in purchase price, annual operating cost, and household income on the consumer purchase decision.

2.10 NATIONAL IMPACT ANALYSIS

The national impact analysis assesses the NPV of total customer LCC and NES. DOE determined both the NPV and the NES for the performance levels considered for the product classes it analyzed. To make the analysis more accessible and transparent to all interested parties, DOE prepared an NES Spreadsheet Model in Microsoft Excel to forecast energy savings and the national economic costs and savings resulting from new standards. The model assessed the aggregate economic impacts of standards at the national level. The NES Spreadsheet Model does not use probability distributions for inputs or outputs. To assess the impact of input uncertainty on the NES and NPV results, DOE can conduct sensitivity analyses by running scenarios on input variables that are of interest.

2.10.1 National Energy Savings Analysis

The inputs for the determination of NES are: (1) annual energy consumption per unit; (2) shipments; (3) product stock; (4) national energy consumption; and (5) site-to-source conversion factors. DOE calculated the national energy consumption by multiplying the number of units, or stock, of products (by vintage) by the unit energy consumption (also by vintage).[b] DOE calculated national annual energy savings as the difference between national energy consumption in the base case (without new energy conservation standards) and in each higher efficiency standards case. The analysis included estimated energy savings by fuel type used for generating electricity. DOE estimated energy consumption and savings based on site energy, and converted the electricity consumption and savings to source energy. Cumulative energy savings are the sum of the annual NES, which DOE determined over specified time periods.

Product stock is dependent on annual shipments and the product lifetime. DOE conducted shipments projections under the base efficiency case and higher efficiency standards cases for a variety of possible product efficiency scenarios and trends. DOE determined that

[b] Vintage represents the age of the product.

shipment projections under the higher standard efficiency cases were lower than those from the base efficiency case projection, because of the higher installed cost of the more efficient products. The projections indicated that higher installed costs would cause some customers to forego product purchases. As a result, DOE used the higher efficiency standard case shipments projection and, in turn, the resulting product stock under the higher efficiency standards case, to determine the NES. Calculating the NES in this way avoids the inclusion of savings resulting from displaced shipments.

2.10.2 Net Present Value Analysis

The inputs for the determination of NPV are (1) total annual installed cost; (2) total annual operating cost savings; (3) discount factor; (4) present value of costs; and (5) present value of savings. DOE calculated NPV as the difference between the present value of operating cost savings and the present value of increased total installed costs. It calculated net savings each year as the difference between total operating cost savings (including electricity, repair, and maintenance cost savings) and increases in total installed costs (including product price and installation cost). DOE calculated savings over the life of the product, accounting for differences in yearly energy rates, and discounted future costs and savings to the present with a discount factor.

DOE calculated increases in total installed costs by multiplying the difference in the total installed cost between the base case and standards case by the annual shipments in the standards case. Because costs of the more efficient products bought in the standards case are higher than those of the products bought in the base case, price increases appear as negative values in the NPV analysis.

DOE expressed operating cost savings as decreases in operating costs associated with the lower energy consumption of products bought in the standards case compared to the base case. Total operating cost savings are the product of savings per unit and the number of units of each vintage surviving in a particular year.

2.10.3 Forecasted Efficiencies

Several of the inputs for the determination of NES (*e.g.*, the annual energy consumption per unit) and NPV (*e.g.*, the total annual installed cost and the total annual operating cost savings) are dependent on the product efficiency. Thus, DOE forecasted efficiencies for the base case and standards cases. The forecasted efficiencies specify the annual shipment-weighted average product efficiencies for future years.

For each of the products considered, DOE based the development of the product efficiencies in the base case on the assignment of efficiencies in the year 2005. In other words, DOE determined the distribution of product efficiencies currently in the marketplace to develop a shipment-weighted efficiency for the year 2005. As described in chapter 11, with the exception of gas cooktops and gas standard ovens, DOE assumed that forecasted efficiencies

remained frozen at the efficiency level in the year 2005 until the end of the forecast period. In the case of gas cooktops and gas standard ovens, DOE did forecast the market share of gas standard ranges equipped with standing pilots to estimate the impact of eliminating standing pilots for these products.

DOE based its standards case forecasts (*i.e.*, forecasts of efficiency trends after standards take effect) on the use of a roll-up efficiency scenario. Under a roll-up scenario, all products at performance levels below a prospective standard are moved, or rolled up, to the minimum performance level allowed under the new standard. The distribution of products at efficiency levels above the new minimum standard levels is assumed to be unaffected (*i.e.*, these products remain at their pre-standard performance levels.) The roll-up efficiency scenario dictates how DOE determined efficiency distributions in the first year a new standard takes effect, but does not define how product efficiency will be distributed in the future. As was done for the base case, DOE assumed that forecasted efficiencies under the standards case remained frozen at the level in the year that standards became effective until the end of the forecast period.

2.11 LIFE-CYCLE COST SUBGROUP ANALYSIS

The LCC subgroup analysis evaluates economic impacts of standards on any identifiable groups of customers who might be disproportionately affected by a change in the national energy conservation standard levels for the considered products. During the NOPR stage of the rulemaking, DOE evaluated the impacts of particular subgroups of customers in part by using the LCC Spreadsheet Model to analyze the LCC and PBP for these particular customers. DOE updated these analyses for the final rule.

For cooking products, DOE analyzed as subgroups: (1) low-income households; (2) households occupied by senior citizens; and (3) households with gas cooking products that do not have electricity.

2.12 MANUFACTURER IMPACT ANALYSIS

The MIA assesses the impacts of new energy conservation standards on manufacturers of the considered products. Potential impacts include financial effects, both quantitative and qualitative, that might lead to changes in the manufacturing practices for these products. DOE identified these potential impacts through interviews with manufacturers and other interested parties.

DOE conducted the MIA in three phases, and further tailored the analytical framework based on interested parties' comments. In Phase I, an industry profile was created to characterize the industry, and a preliminary MIA was conducted to identify important issues that required consideration. In Phase II, an industry cash flow model and an interview questionnaire were prepared to guide subsequent discussions. In Phase III, manufacturers were interviewed, and the

impacts of standards were assessed both quantitatively and qualitatively. Industry and sub-group cash flow and NPV were assessed through use of the Government Regulatory Impact Model (GRIM). Then impacts on competition, manufacturing capacity, employment, and cumulative regulatory burden were assessed based on manufacturer interview feedback and discussions.

2.13 UTILITY IMPACT ANALYSIS

The utility impact analysis assessed the impact of energy conservation standards on the electric and gas utility industries. To carry out this analysis, DOE used a variant of the EIA's National Energy Modeling System (NEMS). NEMS is a large, multi-sectoral, partial-equilibrium model of the U.S. energy sector that EIA has developed over the past decade, primarily for the purpose of preparing the *AEO*. DOE used a variant known as NEMS-BT to provide key inputs to the analysis.[c]

NEMS produces a widely recognized baseline energy forecast for the United States through the year 2030, and is available in the public domain. The typical NEMS outputs include forecasts of electricity sales, price, and avoided electric generating capacity. DOE conducted the utility impact analysis as a scenario departing from the latest *AEO* reference case. In other words, DOE modeled the energy savings impacts from amended energy conservation standards using NEMS-BT to generate forecasts that deviate from the *AEO* reference case.

2.14 EMPLOYMENT IMPACT ANALYSIS

New or amended energy conservation standards can impact employment both directly and indirectly. Direct employment impacts are changes in the number of employees at the plants that produce the covered products, and at the affiliated distribution and service companies, resulting from the adoption of new standards. DOE evaluated direct employment impacts in the MIA. Indirect employment impacts may result from expenditures shifting between goods (the substitution effect) and changes in income and overall expenditure levels (the income effect) that occur due to the adoption of standards. DOE investigated the combined direct and indirect employment impacts using the Pacific Northwest National Laboratory (PNNL)'s "Impact of Sector Energy Technologies" (ImSET) model. PNNL developed the ImSET model for DOE's Office of Planning, Budget, and Analysis. The model estimates the employment and income effects of energy-saving technologies in buildings, industry, and transportation. In comparison

[a] For more information on NEMS, please refer to the U.S. Department of Energy, Energy Information Administration documentation. A useful summary is *National Energy Modeling System: An Overview 2000*, DOE/EIA-0581(2000), March 2000. EIA approves use of the name NEMS to describe only an official version of the model without any modification to code or data. Because this analysis entails some minor code modifications and the model is run under various policy scenarios that are variations on EIA assumptions, DOE refers to the model by the name NEMS-BT (BT is DOE's Building Technologies Program, under whose aegis this work has been performed). NEMS-BT was previously called NEMS-BRS.

with simple economic multiplier approaches, ImSET allows for more complete and automated analysis of the economic impacts of energy conservation investments.

2.15 ENVIRONMENTAL ASSESSMENT

The environmental assessment estimates the impact of possible energy conservation standards on three energy-related pollutants—oxides of nitrogen (NO_x), sulfur dioxide (SO_2), and mercury (Hg)—as well as carbon dioxide (CO_2) emissions. The primary environmental effects of energy conservation standards for the considered products will be reduced emissions resulting from reduced electricity and natural gas consumption. For power sector CO_2 emissions, DOE based these calculations on the NEMS-BT modeling work used for the utility impact analysis. NEMS-BT tracks CO_2 emissions using a detailed module that produces robust results because of its broad coverage of all sectors and inclusion of interactive effects. This approach has the advantage of examining the marginal impact of energy conservation standards for the considered products on the utility generation mix and the subsequent environmental emissions. Two rules regulating SO_2, NO_x, and Hg emission, the Clean Air Intestate Rule (CAIR) and the Clean Air Mercury Rule (CAMR), had been recently vacated by federal courts at the time the NOPR was published. The CAIR would have permanently capped emissions of SO_2 and NO_x in 28 eastern States and the District of Columbia. The CAMR is closely related to the CAIR and would have established standards of performance for Hg emissions from new and existing coal-fired electric utility steam generating units. As a result of the CAIR and the CAMR being vacated, for power sector NO_x and Hg emissions evaluated in the NOPR, DOE estimated and utilized a range of NO_x and Hg emission rates to estimate the power sector emission reductions due to standards. However, on December 23, 2008, the U.S. Court of Appeals for the District of Columbia Circuit decided to allow CAIR to remain in effect until it is replaced by a rule consistent with the court's earlier opinion. As a result, DOE used the NEMS-BT model for the final rule to estimate the NO_x emissions reductions due to standards. With regard to SO_2 emissions, the Clean Air Act Amendments of 1990 set an SO_2 emissions cap on all power generation, but permitted flexibility among generators through the use of emissions allowances and tradable permits. This SO_2 trading process (sometimes called "cap and trade") implies that the standard will have no effect on total physical emissions because emissions will always be at, or near, the allowed emissions ceiling. Consequently, there is no direct SO_2 environmental benefit from a reduction in electricity use due to the proposed energy conservation standards, as long as there is enforcement of the emissions ceiling. CAIR goes beyond the 1990 Clean Air Act Amendments and sets more stringent SO_2 caps for 28 eastern States and the District of Columbia.

Because residential cooking products have an impact on household CO_2 and NO_x emissions at the site, DOE estimated the reduction in these building emissions due to standards.

DOE also estimated the economic value of CO_2, NO_x, and Hg emission reductions. DOE used several sources to estimate a range in the possible economic value. Emissions of SO_2 are capped and, as a result, simulation of SO_2 trading tends to imply that physical emissions effects will be zero. However, there is an SO_2 benefit from conservation in the form of a lower

allowance price. DOE used NEMS-BT to estimate the impact of standards on SO_2-allowance trading and forecasts of SO_2-allowance prices.

2.16 REGULATORY IMPACT ANALYSIS

DOE prepared a regulatory impact analysis (RIA) under Executive Order 12866, "Regulatory Planning and Review," 58 FR 51735, October 4, 1993, which was subject to review under the Executive Order by the Office of Information and Regulatory Affairs (OIRA) at the Office of Management and Budget. The RIA evaluated non-regulatory alternatives to standards, in terms of their ability to achieve significant energy savings in the considered products at a reasonable cost, and compared the effectiveness of each one to the effectiveness of the adopted standards.

DOE recognizes that voluntary or other non-regulatory efforts by manufacturers, utilities, and other interested parties can result in substantial improvements to energy efficiency or reductions in energy consumption. DOE considered the likely effects of non-regulatory initiatives on product energy use, consumer utility, and LCC. DOE based its assessment on the actual impacts of any such initiatives to date, but also considered information presented regarding the impacts that any existing initiative might have in the future.

2.17 DEPARTMENT OF JUSTICE REVIEW

EPCA states that before the Secretary of Energy may prescribe a new or amended energy conservation standard, the Secretary shall ask the U.S. Attorney General to make a determination of "the impact of any lessening of competition…that is likely to result from the imposition of the standard." (42 U.S.C. 6295(o)) Pursuant to this requirement, DOE solicited the views of the Department of Justice (DOJ) on any lessening of competition likely to result from the imposition of the standards. DOE gave full consideration to DOJ's views in assessing economic justification for the standards.